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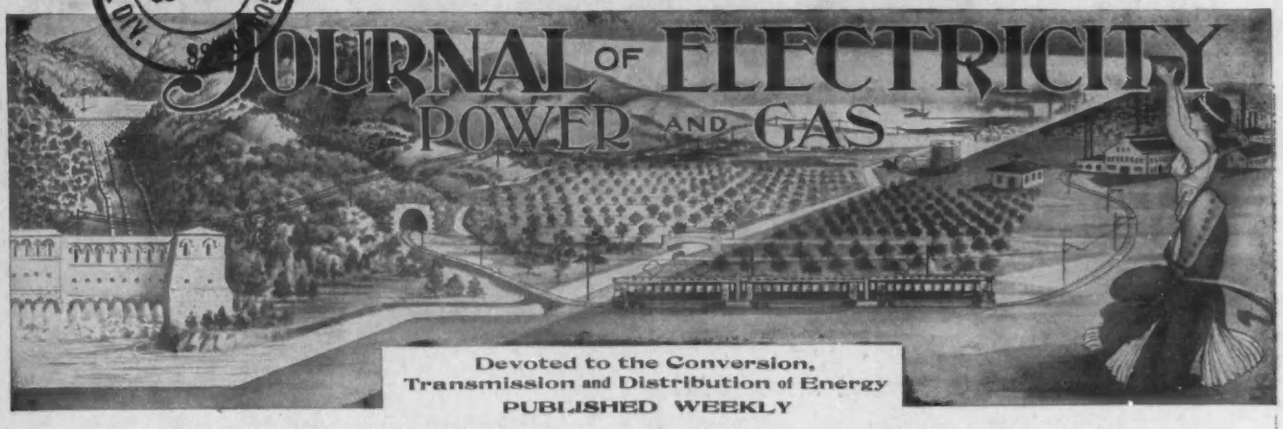

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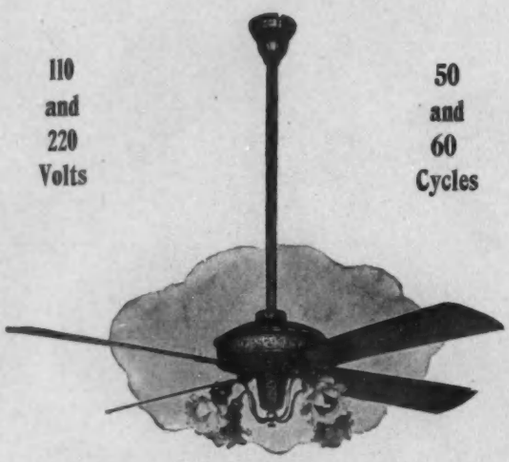

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Journal of Electricity, Power and Gas

Devoted to the Conversion, Transmission and Distribution of Energy.

VOLUME XX. SAN FRANCISCO, CAL., MARCH 28, 1908 No. 13

PROJECTED SUSPENDED RAILWAY IN BERLIN.

By MAX A. R. BRUNNER.

In Berlin there are about 120 street car lines, thirty omnibus, a steam metropolitan railway, and a combination elevated and underground electric railway, opened in 1902. Yet these agents are not sufficient to carry the crowds. During the past thirty years the population has increased three-fold, while the traffic increased twenty-four times. Another underground railway in the heart of the city is almost completed, and others are projected. But the chief requirement is to have a line extending from north to south, as all other railways go west to east.

This short piece has recently been completed, and is illustrated herewith. The track is supported by full girders, consols, and single posts. The structure is simple and does not take away as much light and air as an elevated railway would do. The track support will be changed according to localities. In wide streets or squares, fork-shaped posts with two legs in the lower part will be used. The height of the rails will be above the third story of an average building, and the cars will thus run above the metropolitan and elevated railway, which is to be crossed several times.

TRIAL STRETCH OF SUSPENDED RAILWAY, BERLIN.

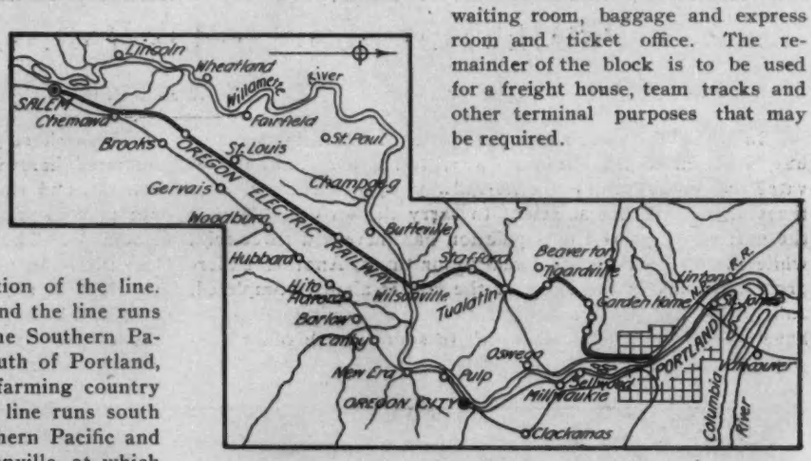
Such a line runs through a densely populated district, where an elevated railway is almost impossible without disfiguring the streets, and an underground system would cost too much. The only solution seems a suspended line similar to that in Elberfeld-Barmen, Germany, the only railway of its kind in the world. When the company owning the patents for this type submitted the plans, the Berlin magistrate ordered a model made in miniature, showing how the new line would alter the appearance of the streets. The firm opened a prize competition for the leading artists and architects to design posts and track which would answer the esthetic and hygienic requirements of such a modern city as Berlin. The result of this contest was a public exhibition, and thereupon the magistrate gave its consent for a provisional trial stretch to be erected in the narrowest portion of the proposed line.

On top of the cars will be wheels similar to mono-rails, which require very few metal parts, in contrast to the heavy trucks of other railways. Thus much weight is saved, or the car body can be enlarged to increase the capacity of the line. Very sharp curves can be taken, without reducing the speed. This facilitates laying out of the proposed line and shortens the time of travel. On curves, the cars will right themselves, and it is impossible that passengers be thrown against the walls. The Elberfeld line has been running several years, and the public has praised its smooth running. A derailment has never taken place. The wheels cling to their rails, and even if one breaks, the remaining three and the hooks hold the hanging car. The whole electric equipment is on the roof, and accessible from a narrow footpath beside the track.

THE OREGON ELECTRIC RAILWAY.*

On February 1st the Oregon Electric Railway Company opened for operation the first portion of its proposed system, an interurban line connecting the cities of Portland and Salem, Ore., a distance of 50.72 miles. The company was incorporated on May 15, 1906, under the laws of Oregon, absorbing at that time the Willamette Valley Traction Company, which held franchises covering part of the present right of way. The capital stock of the company is $10,000,000. During the next few months it is proposed to extend the line from Portland to Hillsboro and Forest Grove, 22 miles. An ultimate extension from Salem up the Willamette valley as far south as Eugene is also contemplated, which will make a total of 135 miles.

The accompanying map shows the location of the line. From the Jefferson Street terminal in Portland the line runs almost directly south, paralleling a line of the Southern Pacific Company to a point about 2½ miles south of Portland, thence turning west through a magnificent farming country to Garden Home. From Garden Home the line runs south again to Tualatin, where it crosses the Southern Pacific and then continues through fertile land to Wilsonville, at which point it crosses the Willamette River on a steel bridge 110 feet above the low water line, thence making a tangent of 19½ miles through small forests and fertile farming country to a point near Chemawa, at which point it again turns south through Chemawa and toward Salem.



OREGON ELECTRIC RAILWAY—MAP OF PRESENT LINE.

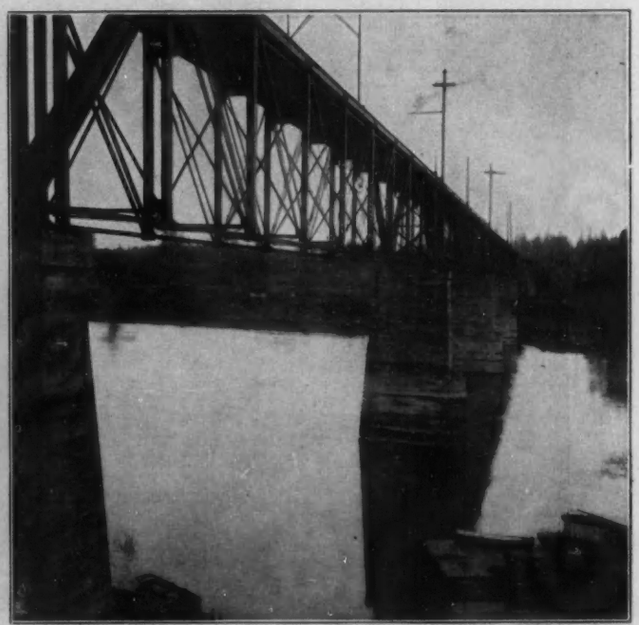
As the line ends for the present at Mill Street in the city of Salem permanent terminal facilities at that point are being arranged for. At Jefferson Street, Portland, the company owns an entire city block. On one corner of this block a building has been erected which contains six storerooms, a waiting room, baggage and express room and ticket office. The remainder of the block is to be used for a freight house, team tracks and other terminal purposes that may be required.

Track and Roadway.

The track and roadbed have been constructed throughout in accordance with the highest standards of steam railroad practice. The small number of curves and grades and the substantial character of the bridges and trestles make it possible to operate with safety at a high rate of speed. The heaviest grade on the line is one of 2½ per cent over a hill just outside the city limits of Portland; none of the other grades exceeds 1 per cent. Including city streets there are only 50 curves and 85 per cent of the track, including a 19½-mile stretch south of Wilsonville, is on tangent. The sharpest curve is 8 degrees.

The track is standard gauge and is laid with 70-pound rails on fir ties. The bonds are of the Ohio Brass Company's "G-D" type. The track is now being ballasted with 2,300 cubic yards of gravel per mile. A large number of cuts and

OREGON ELECTRIC RAILWAY—LONG TIMBER TRESTLE ON CURVE NEAR PORTLAND, 100 FEET HIGH.



OREGON ELECTRIC RAILWAY—STEEL DECK BRIDGE OVER THE WILLAMETTE RIVER AT WILSONVILLE.

While the only intermediate towns of any size are Tualatin and Wilsonville, the entire section traversed is a thickly settled farming community, and there will be numerous stations established at cross roads. Under the schedule which was put into effect at the time of the opening of the road there are 21 stations, including the terminals of Portland and Salem. In naming the new stations the management has selected names of Indian origin. Inasmuch as the Willamette Valley occupies a prominent place in the early history of Oregon, especially in connection with the movements and traditions of the Indians, this idea will be carried out to a certain extent in the advertising of the road.

*Condensed from "Electric Railway Review."

fills were required. The slope of the embankment on fills is 1½ to 1 and in cuts 1 to 1. There are 38 pile trestles. At Wilsonville the road crosses the Willamette River on a steel bridge of four 200-foot spans, with a total length, including trestle approaches, of 3,800 feet.

Power.

Power for the operation of the line is purchased from the Portland Railway Light & Power Company and transmitted from its power plant at Oregon City to the railway over a 9-mile transmission line, carrying current at 33,000 volts pressure and a frequency of 33 cycles. The current is

OREGON ELECTRIC RAILWAY—19½ MILE TANGENT.

converted to the operating pressure of 600 volts in four substations, equipped with 500-kilowatt six-phase, 600-volt rotary converters and the necessary switchboards and transformers, all of General Electric manufacture. The substation buildings, one of which is illustrated herewith, are of concrete and are 36 by 42 feet in size.

OREGON ELECTRIC RAILWAY — STANDARD LOCAL PASSENGER STATION.

The overhead construction is of the catenary type, the No. 0000 trolley wire being suspended from a 7/16-inch galvanized steel messenger cable, supported by 9-foot, 9-inch T-bar brackets from poles set 150 feet apart on tangent and 100 feet apart on curves. The poles also carry the transmission line and the telephone and telegraph wires. The overhead construction, was supplied by the Ohio Brass Company.

Rolling Stock.

The rolling stock equipment of the new road comprises eight passenger motor cars, two electric freight locomotives, and 15 freight cars. An order has been placed for 25 flat cars and 25 box cars to supplement the other freight equipments. As shown by the accompanying illustrations, the passenger cars are large equipments of an especially pleasing design.

OREGON ELECTRIC RAILWAY—STANDARD CONCRETE SUBSTATION.

These cars were built by the Jewett Car Company, Newark, O.

The length of the car from bumper to bumper is 57 feet 8 inches. The car body is 9 feet wide over posts, and when mounted is 13 feet 7¼ inches high from rail to trolley board. The interior of the car is divided into three compartments: a baggage compartment with four folding seats, a smoking compartment with four fixed and four reversible seats, and a general compartment with three fixed and sixteen reversible

OREGON ELECTRIC RAILWAY—LONG TIMBER TRESTLE NEAR PORTLAND.

seats. The toilet compartment occupies a corner next to the rear door. As the cars are arranged for single-end operation the motorman will be entirely shut off from the passengers. His cab is provided with a 24-inch door on one side only. The baggage compartment has two sliding side doors each 3 feet 6 inches wide. The doors in the interior partitions and in the rear bulkhead swing on hinges.

Each car body is mounted on Baldwin heavy M. C. B. type trucks with steel wheels and Symington journal boxes.

Each car is equipped with M. C. B. coupler heads and one locomotive pilot. The electrical equipment on each car includes four 75-horsepower General Electric motors with multiple-unit control. The brake equipment is the Westinghouse Traction Brake Company's A. M. R. schedule with quick-acting rtiple valve, quick recharge, quick service and graduated release features. A No. 3 direct-current air compressor and a slack adjuster are included in the brake equipment. The cars are equipped with De France air sanders. The locomotives are double-ended, of 50 tons weight, and are equipped with two 160-horsepower General Electric motors and pantagraph current collectors.

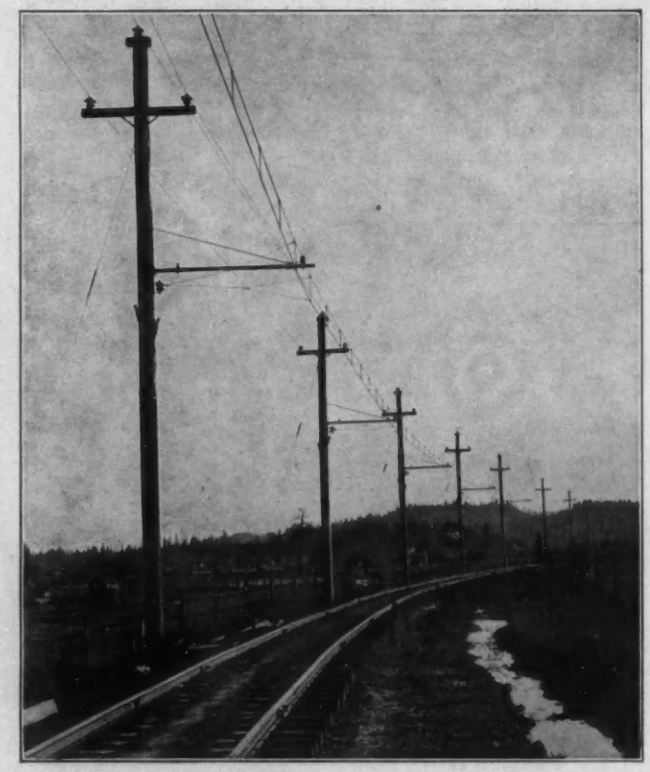
A 60 by 135 foot car house is located at South Portland, and a smaller one at Salem.

Operation.

Trains are to be operated in accordance with the standard code of rules of the American Railway Association. All signals, markers, etc., will also conform to those in general use on steam roads. The dispatchers' office is located at Portland, and standard telegraph train orders will be used. A telephone line has also been provided for use as an auxiliary. The policy of the company is to insist on good and regular service. The dispatching system has been very carefully arranged, and all trainmen who enter the service are required to pass a thorough examination in the rules of the American Railway Association besides a rigid physical examination.

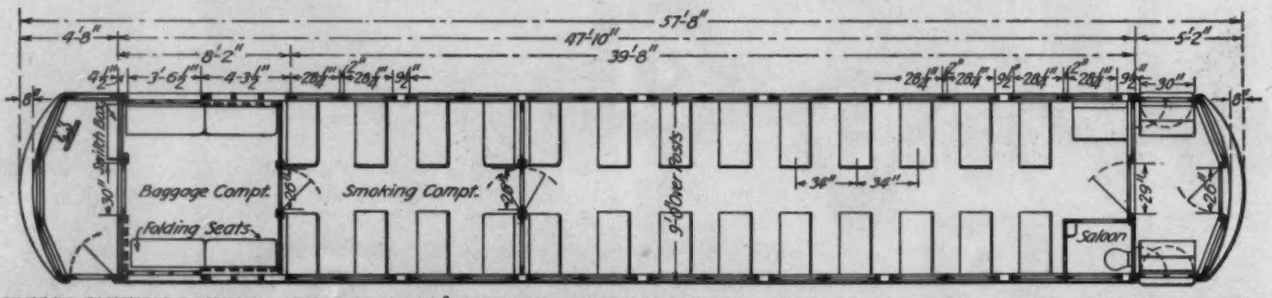
As soon as the ballasting is completed the company will establish a schedule of 10 trains per day in each direction between Portland and Salem. Three trains in each direction will be limited trains making no stops between terminals. It is expected to make the running time of the limiteds 1 hour and 30 minutes, and of the locals 2 hours and 10 minutes. At present 1-car trains are used, but it is planned to eventually operate multiple-unit trains of two and three cars each.

The construction of the road was in the hands of the Willamette Construction Company, a construction organization of the engineering firm of W. S. Barstow & Co., of New York and Portland. R. L. Donald was chief engineer in charge, and F. S. Drake superintendent of construction. The officers of the Oregon Electric Railway are: President, George Barclay Moffat, New York; vice-president and general manager, Guy W. Talbot, Portland; secretary, traffic manager and auditor, George F. Nevins, Portland; assistant secretary,

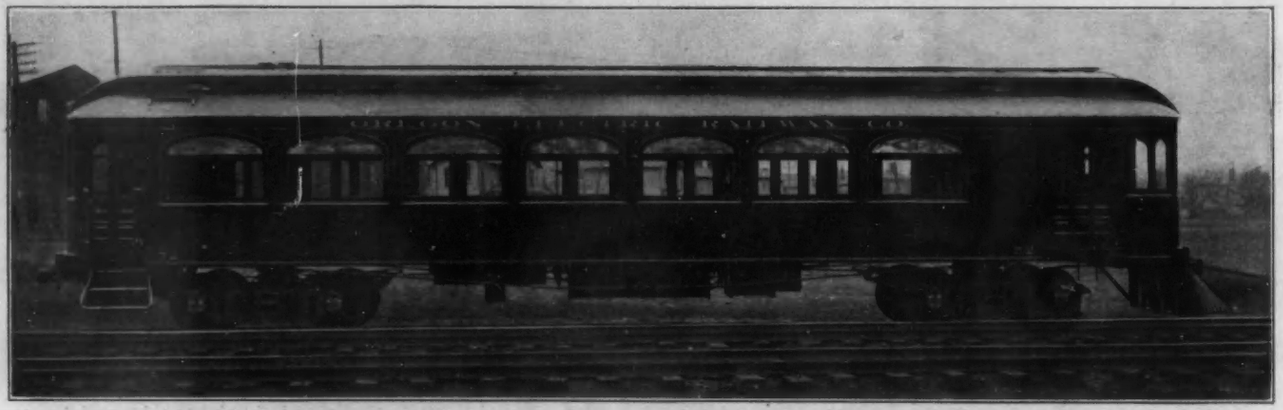


OREGON ELECTRIC RAILWAY — TRANSMISSION BRACKET AND CATENARY CONSTRUCTION ON CURVE.

Francis C. Schwab, New York; treasurer, Henry W. Brower, New York; assistant treasurer, C. H. Still, Portland; superintendent, C. A. Coolidge, Portland.



OREGON ELECTRIC RAILWAY—FLOOR PLAN OF 3-COMPARTMENT PASSENGER CAR, SHOWING SEATING ARRANGEMENT AND PRINCIPAL DIMENSIONS.



OREGON ELECTRIC RAILWAY—SINGLE-END PASSENGER CAR WITH THREE COMPARTMENTS.

FRANCIS TURBINE DETAILS.

By W. F. Uhl, Engineer, Hydraulic Turbine Department, Allis-Chalmers Company.

Your editorial and articles in your issues of February 29 and March 7, we believe justify us as builders and designers of both impulse and reaction turbines. It may be interesting to know that from our point of view as manufacturers, the impulse turbine is far more preferable, as for the same conditions in most cases this type is much more expensive than the reaction type, therefore, contract price would usually be much higher. However, from an engineering standpoint we have learned that up to the point reached at this writing the higher the head under which the reaction turbine has been put in operation, the better the results. Up to date the writer has designed or has been intimately connected with the design and operation of 83,200 horsepower of high pressure reaction turbines, ranging in size of units from 875 horsepower capacity to 13,500 horsepower capacity, and operating under heads from 270 to 550 feet, and in connection with pipe lines ranging in length from 500 feet to 5 miles, the water in them having a velocity of as high as 25 feet per second.

The points which seem to have been given most consideration by the various engineers who discussed the 9,700-horsepower Centerville turbine are as follows: Purchase price, regulation, efficiency, dirty water, economy and maintenance. We will try and take up these various points, giving our experience regarding them, but we do not maintain that other engineers may not have had contrary experiences.

Purchase Price.

The price of the turbine, governor, pressure regulator and generator suitable for the conditions under which the Centerville turbine operates is approximately $37,000, f. o. b., works. It occupies with its auxiliaries and generator, a floor space of 420 square feet. It is a well known fact that the efficiency of the turbine depends upon the specific speed or the speed for unity head per unity of power. Impulse turbines having the same relative specific speed as the Centerville reaction turbine which has a speed of 400 revolutions per minute would require four nozzles of 7 inches diameter jet each. Since it is mechanically inconvenient to use more than two wheels for one unit, and inefficient to use more than one jet on each wheel, with horizontal units, we would require two units for the same output. With the given specific speed each unit would have a speed of 200 revolutions per minute. The price of two such units of the deflecting nozzle type with suitable governors and generators is approximately $60,000, and the floor space occupied is 1,800 square feet. If the reaction turbine is operated with the pressure regulator used as a synchronous bypass, giving the same results as the deflecting nozzle, the economy of the turbines is practically the same, but the hydraulic efficiency is in favor of the reaction turbine. A correctly designed pressure regulator can be arranged to vary its discharge the same as a hand-operated needle nozzle.

Regulation.

The type of turbine has absolutely no effect upon the regulation of the speed of a hydro-electric unit. When the pressure regulator operates as a synchronous bypass the velocity of the water in the pipe line will be constant, as with a deflecting nozzle impulse turbine, and the regulation depends upon the governor and the flywheel effect only. If the governor is of proper design, its regulation depends entirely upon the flywheel effect of the rotating masses, the same as with a steam or gas engine. If the pressure regulator is used automatically so that it will only open for certain predetermined changes of load (as a well designed pressure regulator must operate), the regulation depends also upon the pressure increases and decreases in the pipe line. But these conditions again remain the same with a reaction turbine as with an impulse turbine, providing the impulse turbine also has automatic pressure regulators. Every impulse turbine which is to operate as economically as the reaction turbine must have for the same length of pipe line. There is no reason why pressure regulators should not be used with impulse turbines as well as with reaction turbines. There is no excuse for the deflecting nozzle impulse turbine unless it is necessary to pass the same amount of water regardless of load as may be the case where power plants are operated in conjunction with irrigation projects, or where it is impossible to provide a suitable standpipe on an exceptionally long pipe line.

Efficiency.

From tests so far made on a suitable number of impulse and reaction turbines of numerous makes, we are satisfied that the reaction turbine has the advantage of at least three to four per cent with heads from 200 to 600 feet. What higher heads will produce is yet to be determined, but indications are in favor of the reaction turbine. With an exceptionally well designed impulse turbine 82 to 83 per cent may be obtained as against 85 to 86 per cent with the reaction type. The maximum point of efficiency can be arranged to occur at half gate as well as at full gate, and the efficiency is not necessarily the best at normal gate opening.

Dirty Water.

When the first reaction turbines were built it was assumed for no apparent reason, that dirty water would wear out the turbine parts rapidly. This assumption has proven erroneous, and such parts as have so far shown wear, have been proven to be defective in design, and the wear was in no case due to dirty water. That this should be the case may be readily seen from the fact that the highest velocity the water reaches in a reaction turbine is about $0.67\ V\ 2\ gh$, whereas with the impulse turbine the water reaches a velocity of $0.95\ V\ 2\ gh$. Furthermore, any debris which can pass through the nozzle of an impulse turbine can certainly pass through the reaction turbine.

Economy.

If both types of turbines are provided with automatic governor actuated pressure regulators, the economy should be the same, but with the pressure regulator used as a synchronous bypass on the reaction turbine, it is more economical than the deflecting nozzle type, since the bypass can be arranged to be automatically adjustable, whereas the needle must be operated by hand.

Maintenance.

A reaction turbine, due to its construction, is much more adaptable to good substantial mechanical design than either the deflecting nozzle, hand-regulated needle type, or the stationary nozzle type with governor actuated needle and pressure regulator. There is no excuse for any part of a reaction turbine breaking since there is no part where it is necessary to use a small factor of safety to gain small weight. The design of the runners themselves is very compact and solid in one piece, with no parts being held together by bolts, whereas the impulse turbine wheel has many component parts, and it is a noteworthy fact that many wheels have broken with disastrous results.

Regarding multiple nozzle impulse wheels it is not possible to make a good design with more than one nozzle for a single horizontal unit. With vertical units, it is possible to

make a number of nozzles to one wheel, but this brings into question the thrust bearing, and the higher the speed the less desirable is the thrust bearing of the vertical type, since the rotating parts cannot be balanced as is possible with the reaction turbine.

Oil lubricated thrust bearings give no more trouble than a ring oiling horizontal bearing but their sphere of usefulness is limited and our experience will not permit us to recommend oil pressure thrust bearings. They are unreliable, and a spare unit must be at command at all times; furthermore, the maintenance of an elaborate oil pumping system, which must be in duplicate to be safe, is an item which often means the difference between dividends on an investment and the failure of it.

Draft tubes for impulse turbines, or for that matter, with any type of turbine other than the reaction turbine have not proven a success, and as far as we know, they are a waste of money. A properly designed draft tube with a reaction turbine, although not necessary, provides for a change in the tail water level, and since it is necessary to place the lowest point of impulse wheel above the highest tail water, which occurs usually for only one or two days in a year, a large percentage of the total head is lost at all times, since the head water almost always varies with the tail water, leaving the total head the same. The head usually lost with an impulse turbine is about 20 feet. For the same amount of water, therefore, under 550-foot head we lose 300 horsepower on the 9,700 horsepower turbine, which, at $30.00 per horsepower, per year, means a loss of $9,000.00 net.

When buyers forget to forget; when competition ceases to compete; when every actual and prospective customer has been convinced that your product is the best of its kind and nothing better can be produced, then, and only then, will it be safe to get along without advertising.

Just so long as old buyers die and new ones take their places; just so long as there is competition to coax your customers from you; just so long as there is a possibility that somebody else will produce a better product, just so long will it be important, absolutely necessary, to carry on the work of educating and reminding your own and your competitors' customers as to your goods.

And just so long as the buyers and prospective buyers in a given trade or profession subscribe to the publications representing that trade or profession, just so long will there be no better way to reach and impress them with your business story, than through the technical and trade publications which they look to and depend upon for the information which enables them to compete successfully along their own lines.

Is it not quite as necessary to do this work of educating and reminding in dull times as when business is brisk? It takes time, at any time, to excite interest and create desire; new men are coming into your business field every day; there is always plenty of worth while material to work on. Where, then, is there any saving in the temporary discontinuance of a work which must be done—which must be done more and harder and at greater cost if once interrupted?—Selling Magazine.

ELECTRIFICATION OF RAILWAYS.

By Dr. Gisbert Kapp.

(Continued.)

Switzerland.—As regards lack of coal and abundance of water power, Switzerland is very much in the same position as Italy, but the condition of its railway service is somewhat different, as nearly all roads are very hilly, very high speeds are not required, and summer tourist traffic is of greater importance than elsewhere. In the beginning of 1904 the Swiss Government called together a committee of experts, and instructed them to report on the electrification of the whole of the Swiss railways, which meanwhile have become State property. There is in Switzerland a growing tendency for the nationalization of the more importrait water powers, and an apprehension that by the time the Government is ready to electrify the railways there will be no water powers left out of private hands. Hence the committee was instructed first of all to ascertain what amount of power will be required for the railway service, so that the Government may secure the necessary powers ere it be too late. Besides Swiss railway officials and Prof. Wyssling, who acts as general secretary, the committee contains representatives of the large Swiss electrical firms and the societies of electrical engineering and central stations. The reference for the labors of this committee is as follows: (1) What power is required for electrifying all Swiss railways; (2) report on the various systems of electric traction; (3) give a list of those water powers which could be utilized; (4) give capital cost and annual working expenses; (5) establish standards for electrification. The committee has issued an interim report dealing with the first reference. It is still working, and further reports may be expected during this year. The demand for power has been calculated on the basis of the actual goods and passenger traffic on the busiest day in summer and winter. In making the calculation for every train the profile of the line and the energy wasted in starting were taken into consideration, the air resistance was calculated from Barbier's formula corrected by the results of the Zossen trials, and no pains have been spared to get accurate results. The summer traffic is, of course, heavier than the winter traffic, but in winter the energy for heating and lighting has also to be supplied. Both together amount on the average to 13 per cent of the energy required for traction. The energy that has to be supplied per day per passenger for heating has been found from experiments on the Frieburg-Murten Railway (where the coaches are electrically heated) to be 1,100 watt-hours. For lighting the daily energy is only 230 watt-hours per passenger seat, the low average being due to the fact that, with the exception of the Gothard, there are no lines on which passenger trains run the night through. To be on the safe side, the committee figured on weight of trains somewhat in excess of those now prevailing in steam traction, but they assumed that the whole service would be by locomotives, not motor coaches. This, although not the most economical, is an unavoidable method of working, since the Swiss lines must take over the International trains as they are delivered

over the frontier from four different countries. The committee also made a very safe estimate as regards over-all efficiency (only 40 per cent), and did not allow anything for recuperation, which is quite a valuable feature on the Valtellina line. Since the system to be adopted is not yet decided, it was, perhaps, as well that recuperation of energy on down grades and slowing up, which is a peculiarity of one particular system, should be left out of account. I merely mention the matter to show that the estimate made is certainly rather above than below actual requirements. Yet the total power required is astonishingly small. The total energy to be developed on the shaft of the turbines in 24 hours is only 2.4 million horsepower hours, or a steady load of 100,000 horsepower. The committee has also reckoned cautiously as regards the overlapping of the demand which may come on to the same power house from various lines. They assume that the maximum demand may be as much as five times the average, and thus they find that the total power of the turbines which will be required in the various power houses will aggregate to 500,000 horsepower. It is interesting to compare with these estimates the amount of energy actually developed by locomotives as far as an estimate is possible from the amount of coal used. The Swiss railways consume annually over three-quarter million tons, or 2,200 tons daily, which corresponds to about 800,000 horsepower hours of tractive energy. The committee reckon 40 per cent of 2.4 million or 960,000 horsepower hours.

Sweden.—This country should prove a promising field for electrification, in so far as it has water power and coal is dear, the price paid by the Swedish railways reaching and exceeding sometimes 22s. per ton. On the other hand, the enormous distances and the low density of population of only 30 inhabitants to the square mile are adverse factors. When one considers that the cost of feeders, sub-station, and electric equipment of the permanent way comes to about £2,000 per mile of track, it is easy to see that the capital outlay and maintenance, although not important items on a line with plenty of traffic, will be a rather heavy burden on lines which have only little traffic. Yet the Swedish Government has made a beginning with electrification. Some years ago it sent its chief electrician, Mr. Robert Dahlander, to the continent of Europe and to America to study the question of working main lines electrically, and on his return in the beginning of 1904 the Swedish Parliament voted £23,500 for experiments on two short lines running out of Stockholm to the northwest and north. At Tomteboda a power house was fitted with two De Laval turbo-generators of 270 horsepower each, producing 500-volt single-phase current at 25 frequency. The generators are arranged for variable speed, so that a frequency of 20 and one of 15 can also be had. Only single-phase current is being used, Mr. Dahlander having come to the conclusion that neither of the other two systems is equally suitable on lines on which, by reason of their great length, a very high pressure in the trolley wire is essential. To lower the pressure and use more sub-stations would on lines with little traffic not be economically justifiable, whilst the higher efficiency of either of the other systems is of little importance in a country where water power is not only cheap, but supplied from lakes which form natural storage reservoirs to be drawn upon for the peak loads. The trolley line is suspended from single and on certain parts from double catenaries. The same posts also carry telephone wires, and it was observed that the latter assumed a potential of 4,500 volts to earth when the trolley wire received current at 20,000 volts. Means had, therefore, to be found to carry off to earth the charge induced in the telephone circuit without interfering with its use as a telephone line. In addition to drilling in the usual way to eliminate induced currents, an electro-magnet with double winding was put at either end as a shunt to the line and the middle point of the winding connected to earth. The self-induction of this magnet is sufficiently great to prevent any appreciable part of the telephonic currents being shunted, whilst static charges flowing to earth through the middle point to the winding, and, therefore, through the windings in opposite sense, encounter no self-induction. The trolley voltage is obtained by step-up transformers in the power house, and the latter are so arranged that by changing the connections of the sub-divided winding pressures varying from 5,000 to 37,500 volts can be obtained. The British Westinghouse Company, the Siemens-Schuckertwerke, and the Allgemeine Elektricitats-Gesellschaft of Berlin have each supplied rolling-stock for this experimental line. The Westinghouse locomotive is adapted to take current at 3, 6, 12, 15, and 18 thousand volts; it has two driving axles each fitted by spur gear with a 150-horsepower motor, and the maximum tractive effort is four tons. The Siemens locomotive is built for a trolley voltage of 20,000 volts; it weighs 36 tons and its maximum tractive effort is six tons. It has three driving axles, and is fitted with three compensated series motors of 110 horsepower normal capacity, the voltage of 350 being obtained by a transformator of 350 k. v. a. output carried on the locomotive. The motors are cooled by air blast taken through a gauze filter to prevent dust getting to the motors. The motor-coach train was supplied by the Allgemeine Elektricitats-Gesellschaft. Each motor coach is fitted with two 120-horsepower Winter-Eichberg motors adapted to take current at 6,000 volts. The gear fitted at present permits of a maximum speed of 28 miles per hour, but other gear wheels have been supplied, so that by putting these on the speed may be increased to 40 miles per hour. The motor coaches are fitted with the usual bow collector, but as it is intended to experiment also with the Oerlikon system, the necessary provision for the Oerlikon rod has been made on the roof of the coach. The regular service by electric traction was started on the Stockholm-Jarfva section on February 23rd of last year, the rolling stock here described being used. Whilst the experiments were in progress the Swedish Government purchased three waterfalls with an aggregate of 24,600 horsepower, which, with the Trollhattan and Elfkarleby Falls already in its possession, will enable it to supply over 50,000 horsepower for railway traction in the southern part of Sweden over about 1,300 miles of line. For this part of the country Mr. Dahlander has worked out complete plans and estimates for electrification. There will be five large power houses, and the water power now in possession of the State will suffice for present requirements, but Mr. Dahlander estimates an increase of 60 per cent in the traffic by 1920, and to provide for this he supplements two of the power stations by steam plant, the fuel being peat. The pressure in the feeders will be 50,000 volts, and that in the trolley 15,000 volts. The lines total up to 1,380 miles, and the single tracks, including sidings, to 2,800 miles. The five power houses will contain steam and water turbines, with a total of 80,000 horsepower, and the cost of the generating plant, including the purchase of water rights, comes to £1,540,000, whilst the cost of feeders, sub-stations, and electric equipment of the permanent way amounts to £2,620,000, so that the total outlay is estimated at £4,160,000. The cost of electric locomotives is not included in this sum. In estimating the cost of maintenance and working expenses, Mr. Dahlander includes locomotive charges. He also assumes that for the present fifty of the existing steam locomotives would be retained as reserves, and that each of these would do about 6,000 miles per annum. The net result of these calculations is that with coal at 22s. a ton the annual saving in 1920 will amount to about £200,000.

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A. H. HALLORAN, Secy. and Managing Editor

Directors:

R. J. DAVIS
A. M. HUNT
E. M. SCRIBNER
C. L. CORY
E. B. STRONG

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EDITORIAL.

IN SYNCHRONISM.

The alternating currents of some unknown, all-powerful, all-pervading force, by some called Destiny, by others, Divinity, influence man, much as currents of electricity affect a conductor. While in the aggregate it accomplishes much, yet its evidence in the individual is usually slight, and ultimately independent of him. Like the electric current, it is made manifest only by its effects, and is evident only when interrupted.

An electric current causes either heat, magnetism, or chemical action. Analogously affected by this infinite force, man may be heated by the enthusiasm of ambition, contagious to those contiguous. He is, as it were, surrounded with a magnetic field, which induces action in others near him, and causes their lives to parallel that indicated by its direction. As in electrolysis, it is continually changing from the homogeneous to the heterogeneous.

Resistance may divert, but never destroy its power. It cannot be insulated, nor can we plot the characteristic of the Generator. Religion's attempt to explain its working is no more successful than is the calculus in explaining alternating current phenomena to the non-mathematician. Religious madness is often evinced by hysteria, as is residual magnetism by hysteresis.

Recent investigations by Dr. J. Siebel, of Chicago, would seem to indicate that the human body is made up of numberless minute electric batteries. Alcohol, sugar, and fats furnish the positive elements, the alkaline carbonate the negative, which transfer the oxygen from the oxyhemoglobin of the blood to these cells. The electro-motive force set up by them becomes the muscular force of the system. He even proposes to use denatured alcohol and sodium-bicarbonate as the elements for a commercial battery. But these currents are subsidiary, and are dominated by the master force that appears as will power in the individual. Man's efforts to thwart this purpose are often due to the counter electro-motive force of self-induction. He may temporarily shunt it, but is more likely to cause a disastrous short circuit.

Its work is measured by the great march of human progress, as is shown in the meter history, whose dial is illuminated by its manifestation in the lamp of experience.

During any period its apparent direction may be alternated, but at the end there is always advance. It leads with increased capacity and lags with impedance. The reciprocal of impedance is admittance. This polyphase force can be transformed and converted, and it often causes eddy currents.

Its cycles we can trace throughout all the Universe—through the geologic evolution of the earth and of every organism therein; through the evolution of human society, whether religious, political or economical, the latter, however, being psychic as well as cyclic. During the Dark Ages its energy was potential rather than kinetic, being stored in the Latin language as an accumulator, for whose discharge the Church acted as a poorly designed maximum cut-out, until its resistance was overcome by the Renaissance.

If man's belief undergoes no change as his knowledge of its various phases increases, he is as one who will not accept the facts demonstrating the intimate atomic relation between matter and electricity.

The latest theory, that an electric current consists of the displacement of the electrical charges of the constituent atoms, might similarly apply to the currents of this force, except that some are more highly charged with this energy than others. Its transmission is wireless. Both have been likened to a great stream whose sources, while individually small, ultimately unite, one by one, each with the other, to form a mighty river of life-giving power. Or, again, a great hydro-electric system may be compared with the system of human society feeding on to the transmission lines of universal progress, and centrally regulated by a master Governor, just as is the harmony of a great orchestric symphony directed by the leader's baton.

These and all other speculations should be regarded merely as forms in which are molded the reinforced concrete, necessary in construction, but to be removed as the powerhouse nears completion, leaving its grandeur unimpaired by unsightly staging. Certain great truths, slowly evolved through ages past, already stand forth as magnificent window-arches, indicative of the splendor of the building as yet unfinished by this constructive force.

Disregarding the unanswered question of, "What is?," the great riddle of the Universe, man is personally far more interested in the immediate application of this force to his needs. "What shall I do with it?" is the question that each must answer for himself, and upon his utilization depends his success. In connection with this we needs must note the comparatively recent growth of the idea of man's brotherhood. Our limited perspective through the glass of history shows us a period just past, where man was heedless of the welfare of others, particularly of future generations. The beginning of the present cycle indicates an endeavor to remedy this, as is shown by the attempt at conservation of the great natural resources of the earth, man's splendid heritage. We know not what the next cycle will accomplish, but we do know that efficiency is obtained only when man is running in synchronism with the Generator.

TRADE CATALOGUES.

Bulletin No. 384 from the National Brake & Electric Company is devoted to National type "3 V S" air compressor, a single-stage machine with three vertical cylinders, motor driven.

Fort Wayne electric fan motors are illustrated and described in Bulletin No. 1105 from the Fort Wayne Electric Works. They are made in several styles for either direct or alternating current.

H. W. Johns-Manville Co. sends a unique booklet on "Advantages of a Built Up Ready Roofing" requiring no preservative coating. A number of typical installations of J.-M. asbestos roofing are shown.

The Brown Hoisting Machinery Company, of Cleveland, Ohio, sends a well-illustrated catalogue describing "Brownhoist" locomotive cranes with patent grab buckets for handling coal, ore, sand, ashes, etc.

Fort Wayne Electric Works, of Fort Wayne, Ind., send Bulletin No. 1104, illustrating and describing their multiphase belted alternators, form B, which are made with either two or three phase windings, for 2,300, 1,150, 600, 480 and 240 volts, and which can handle motors, series arcs, and incandescents from the same machine at the same time. They are constructed to carry 75 per cent of their three-phase output within the standard heating guarantees when used to supply current to single-phase circuits.

MEETING NOTICE.

The next monthly meeting of The American Society of Mechanical Engineers will be held in the auditorium of the Engineering Societies Building, New York, on the evening of April 14. The general subject of the meeting is "The Conservation of Our National Resources," which is now receiving unusual attention, because of the invitation of the President of the United States to the Governors of the several States, and to the presidents of the National Engineering Societies, to confer with him in Washington on this important problem. The New York meeting will be addressed by four speakers, who will consider forest preservation in its relation to water power, economy in the utilization of fuels, and the attitude of the engineer in regard to these. Dr. Henry S. Pritchett, president of the Carnegie Foundation for the Advancement of Teaching, will be one of the speakers, and will discuss the "Relation of the Engineer to the Body Politic."

PERSONAL.

H. C. Parker has joined the staff of the California Gas & Electric Corporation.

A. C. Garrison, representing the Columbia Incandescent Lamp Company, of St. Louis, has been in San Francisco recently.

Fred C. Finkle, consulting engineer, of Los Angeles, ha gone to Portland, Oregon, as chief engineer for the Mt. Hood Ry. and Power Co., to let new contracts for hydraulic and electric equipment ne essary to complete the work.

G. I. Kinney has succeeded H. C. Parker as the San Francisco representative of the Fort Wayne Electric Works, Northern Electrical Manufacturing Company, and Sprague Electric Company, with offices at 403-405 Atlas Building.

S. P. Russell, Jr., has returned home to take charge of the electrical department of the San Francisco office of H. W. Johns-Manville Co., after an extensive experience throughout the East. We are glad to welcome him back, and know that there is no place where he can be of greater service to his company than among his friends, and they are legion.

M. L. DOWNS, secretary and general manager of the Brookfield Glass Company of New York City, has proceeded from San Francisco to Seattle in the course of his extended visit to the Pacific Coast in the general interests of his company. He leaves behind a host of friends. The report o the prosperity of the West from such influential men as Mr. Downs will do much to restore public confidence in the East.

The American Society of Mechanical Engineers, with the desire to still further develop their publications, have been fortunate in securing Mr. Lester G. French to direct their editorial department. Among the immediate improvements to be undertaken is the establishing of departments in the monthly Proceedings, thus providing a greater variety of technical articles of interest. Many other features are planned, and the aim will be to make the Proceedings of such value that no engineer can afford to be without them. All such papers, however, will first be presented and discussed before the society at its meetings, as formerly, thus benefiting the membership two-fold. Mr. French was born in Keene, New Hampshire, in 1869, and very early commenced his training in editorial work and printing at Brattleboro, Vt., his father having been the publisher for a very long time of "The Vermont Phoenix," and a partner in a large printing establishment in that same place. In 1891, Mr. French received his degree in mechanical engineering from the Massachusetts Institute of Technology. After four years' apprenticeship, drafting-room and shop experience, principally at the Builders' Iron Foundry shops in Providence, and a year and a half as a text-book writer, Mr. French was engaged on the editorial staff of "Machinery," and assisted greatly in the development of that paper, and for nine years was its editor-in-chief. Recently Mr. French re-engaged in the publishing of text-books on algebra, applied mechanics, and of a treatise on steam turbines.

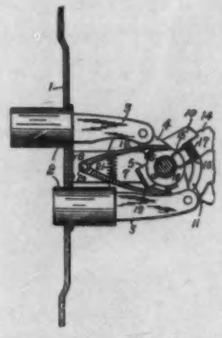
TRADE NOTICE.

The Locke Insulator Mfg. Co., of Victor, N. Y., have appointed as agents for Eastern Canada, the Engineering Equipment & Supply Co., Lindsay Building, Montreal, Canada.

PATENTS

ELECTRIC SWITCH. 881,300. Everett M. Coffin, Oakland, Cal.

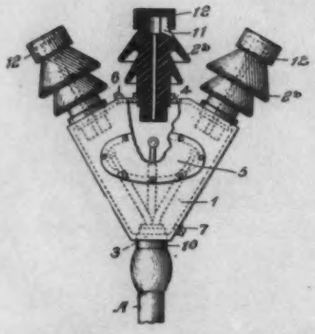
The combination of a contact, a shaft upon which contact rocks, a shifter also rocking on said shaft and operatively connected with contact, a coiled spring around the shaft for



energizing shifter, and a controller also rocking on shaft for energizing coiled spring, shifter and controller each having side members and a bridge connecting them, the coiled spring lying within the side members of the shifter, and the latter lying within the side members of the controller.

TERMINAL FOR ELECTRIC CABLES. 881,777. Charles W. Davis, Edgeworth, Pa., assignor to Standard Underground Cable Company, Pittsburg, Pa.

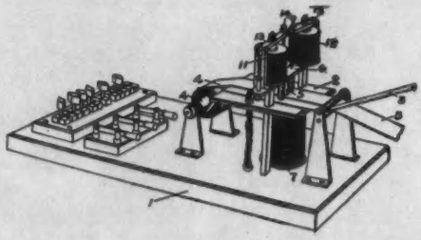
In a terminal for an electric cable the combination with a case or shell, of a plug for an outward leading wire, plug



being formed of insulating material molded on wire, and provided with an outwardly and downwardly flaring petticoat and provided with a groove for the reception of a line wire arranged adjacent to one end and above the plane of the petticoat, and having at its opposite end means for attachment to a support.

CHRONOGRAPH. 881,479. Ezra B. Merriam, Schenectady, N. Y., assignor to General Electric Company.

Means for recording the frequency of an alternating current, comprising an electromagnet connected to be energized



by said current, a table above the same, a bridge over table, a guide depending from bridge in line with electromagnet, and a loose weight in guide carrying a marking point connected to be actuated by current for producing alternating light and heavy marks corresponding with the cycles of alternating current of known frequency.

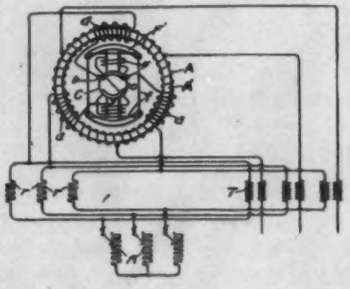
ELECTRICAL SOCKET-SEAL. 881,683. Llewellyn T. Hatfield, Sacramento, Cal.

The combination with an electrical socket, of a sealing

device arranged in socket, permitting the insertion of a current consuming plug and preventing electrical connection with the socket contacts.

SELF-EXCITED ALTERNATOR. 881,647. Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to General Electric Company.

In a self-exciting alternator, a main armature winding, an auxiliary winding, a field winding provided with a rectify-

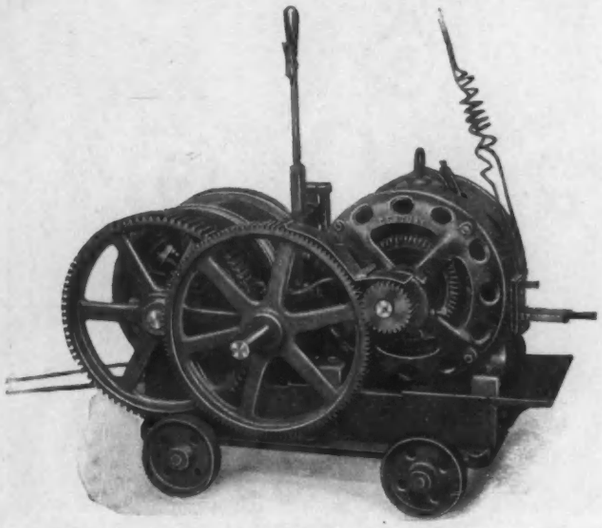


ing commutator, brushes bearing on commutator and connected to auxiliary winding, and a short-circuited winding carried by the field magnet in inductive relation to auxiliary winding.

INDUSTRIAL

SINGLE-PHASE MOTOR APPLICATIONS.

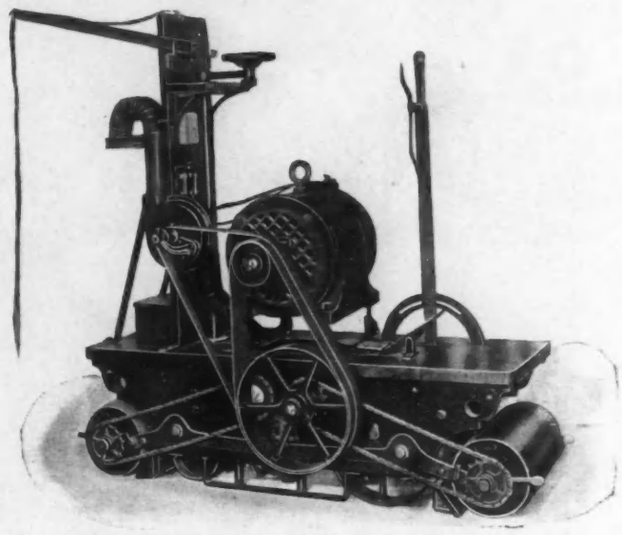
Examples of new applications of single-phase motors to industrial purposes are always of interest as showing its universality of possible use. The accompanying illustration shows a building contractors' hoist manufactured by the Patten Manufacturing Company, of Chattanooga, Tenn. The motor is a 7½-horsepower, single-phase, self-starting motor manufactured by the Century Electric Company, St. Louis. This outfit shown herewith has a capacity of hoisting 500 feet at a speed of 500 feet per minute. The machine is designed especially for hoisting brick, mortar, concrete, fireproofing, etc., by means of standard double-platform arrangements.



BUILDING CONTRACTORS' HOIST.

The platforms are started, stopped, and reversed by the operation of a single lever, which operates so simply and positively that a 15-year-old boy can operate it satisfactorily. The driving shaft of the hoist operates in one direction, so that standard, constant-speed motors can be used (thereby effecting considerable saving in the first cost of the motor), and also providing the means of operating a winch-head for hoisting lumber and other material with block and fall, and also provides for driving an extended shaft from which can be operated a concrete mixer, cut-off saw, etc., all operations being independent of each other. The feature that deserves particular attention is, this machine can be operated by single-phase motors with the same satisfaction when operating on one phase of a multiphase circuit as a single-phase circuit. This hoist is designed along lines radically different from any heretofore used, and represents the hoist development not often attained in the design of a portable builders' hoist. The weight of the outfit is such that it can be hauled in an ordinary brick wagon. This hoisting machine is manufactured for capacities from 500 to 1,000 pounds, and for speeds from 250 to 500 feet per minute. The manufacturers guarantee this hoist to save money on any brick or concrete building over one story in height; claimed to be able to raise 1,000 brick with mortar at a cost approximately of 2 cents for electric power.

After the building is constructed, the floors usually have to be smoothed, and for this purpose, the floor-surfacing machine, manufactured by the American Floor Surfacing Machine Company, of Toledo, Ohio, is rapidly coming into use. The illustration herewith shows one which is operated by a 5-horsepower, single-phase, self-starting motor manufactured by the Century Electric Company, St. Louis, Mo. This machine, the manufacturers claim, will do as much work as



FLOOR SURFACING MACHINE.

20 men will do by hand, and besides, doing it much cheaper and better, and is rapidly creating a demand for surfaced floors, which will harmonize with the balance of the interior finish. This machine is adapted to the surfacing of every class of floors, from pine to the finest parquetry, from bowling alleys to the largest buildings in the country. The sandpaper drum is of such dimensions as to insure the best finish, which is impossible to accomplish by hand work. By a very slight change of the drums, the machine can be arranged to polish and wax floors, and thus be put to three distinct uses. The central station manager would do well to favor the purchase and use of such equipments in his city.

The Chase-Shawmut Company, of Newburyport, Mass., have placed upon the market the Shawmut Rail Bond Protector, a device designed to protect both the soldered and plug type of bond from being sheared off by wagon wheels, damaged by paving stones or ballast, injured by track crews and to discourage theft. This protector is made of heavy steel, securely fastened to rail by means of bolts, which hold fishplate in place, thus making application of the simplest nature. It is of such shape as to allow inspection of bond without removal of fishplates, and can be applied to either new or old rails at a minimum cost without impeding traffic.

H. W. JOHNS-MANVILLE COMPANY.

Recently, as was announced in these columns, the local branch of H. W. Johns-Manville Company moved to the commodious and convenient quarters at 159-165 New Montgomery Street, shown by the accompanying illustration. The

Mr. Chas. W. Scott has lately assumed the management of the San Francisco branch, and the general management of the San Francisco and Los Angeles branches of this company. His extensive experience as resident salesman for three years in the New York office, and his work as sales manager

H. W. JOHNS-MANVILLE CO'S. SAN FRANCISCO OFFICE.

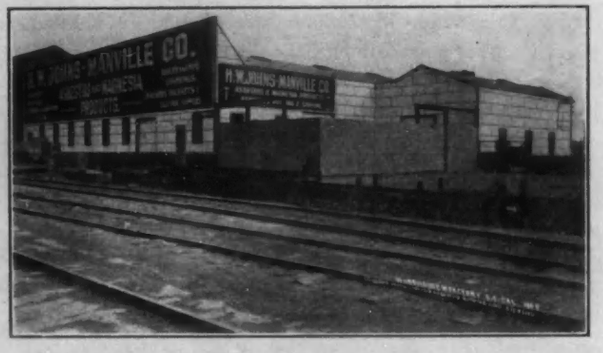
interior view of the office gives an idea of the manner in which the sales business is systematized, and the Oakland

INTERIOR OF OFFICE.

warehouse shows the shipping facilities of the firm. The new location gives every facility for handling all orders promptly and satisfactorily.

at Newark, N. J., has eminently fitted him to take charge of the company's interests on the Pacific Coast.

H. W. Johns-Manville Company has been closely identified with the development of the various uses of asbestos



SAN FRANCISCO WAREHOUSES.

and magnesia products. These possess protective and insulating qualities that are applicable to many industrial needs. Asbestos is mined from narrow veins as a mineral resembling

serpentine. It yields strong fibres that can be woven or spun in various forms that are not only fire and acid proof, but also non-conducting. Magnesia as prepared from magnesium carbonate will set when mixed with water to form infusible shapes that are likewise insulating.

These materials are made into sectional pipe coverings and conduits. They make various packings for steam, air, oil, and gas, and are also used in papers, sheets, blocks and cements. One important application is for roofing and building, incidentally being used on the warehouse roof shown in the accompanying view.

The electrical uses are important, including "Noark" protective fuse devices, Vulcabeston and "Phoenix" insulation and overhead line material. The electrical end of the business has become so important as to require the services of a large corps of salesmen. S. P. Russell, Jr., has lately assumed charge of the local electrical department.

AIDS TO THE SOLUTION OF PRACTICAL ILLUMINATING PROBLEMS.

The science of illuminating engineering is as yet in its infancy, and data of value in the laying out of lighting installations is not plentiful. The activity of the General Electric Company in the advancement of the art of illumination is evidenced by its systematic dissemination of information on this subject. Two bulletins, recently compiled by the Harrison, New Jersey, Works of the Company, illustrate the thoroughness with which such subjects are now being treated. These bulletins are valuable primarily to the practical man engaged in planning lighting installations and are also of interest to every central-station organization as a whole.

A perusal of these bulletins, Nos. 4561 and 4506, on Gem High-Efficiency Incandescent Units and Tantalum Incandescent Lamps, respectively, will convince the reader of their value as aids to the solution of practical illuminating problems. The illumination tables contained in these bulletins are invaluable in such work, and contain information hitherto not available. This data lends itself readily to the laying out of lighting installations, and will be appreciated by architects, contractors, solicitors, and others daily confronted with the solving of illuminating problems.

In Bulletin No. 4566, the tantalum lamp, with its high efficiency and long life, is specially recommended to central stations as a desirable factor in the reducing of peak load conditions, inasmuch as the use of the 40 or 80-watt tantalum lamps gives the customer twenty-five per cent more light than the standard 16 or 32-candlepower lamps, and with an expenditure of twenty per cent less energy on the part of the central station. Thus it is seen that the general satisfaction which attends the use of the tantalum lamp is shared alike by both buyer and seller of current. Stress is laid on the brilliant and attractive quality of light emitted by the tantalum lamps, qualities which make it most desirable for hotels, theaters, cafes, stores and all public buildings.

The use of the table showing the actual amount saved in dollars and cents by the use of these lamps, should prove of great value to lighting solicitors as a convincing argument in favor of the more brilliant and efficient tantalum lamps. This table shows that the tantalum lamp, at the average lighting rates now in force, will save more than twice the initial cost during its average life of 750 hours.

Several pages are devoted to the elucidation of a practical method for the solution of illuminating problem. The illumination table intended for use in connection with this method is comprehensive for the 80-watt lamps with three types of holophane reflectors, and by interpolation can also be used for the 40-watt and 50-watt tantalum units. Several curves giving the candlepower distribution with different types of holophane reflectors are also shown.

Bulletin No. 4561 contains valuable information in regard to "Gem" high-efficiency incandescent units. These lighting units are composed of the "Gem" lamps with varying types of holophane reflectors, and are made in 100, 125, 187 and 250 watt sizes. Candlepower values of these lamps are not given, as it is obvious that these values will vary according to the type of reflector used.

The method of solving illuminating problems, which was referred to in Bulletin No. 4566, is here treated more fully. The subject of illumination in general is taken up and treated briefly. This is followed by a specific treatment of the subject with reference to "Gem" high-efficiency units. Assuming the degree of illumination desired, a problem is worked out, reference being made to the illumination tables for the solution.

Two photographs are shown of the interior of a dry goods store before and after the installation of "Gem" units. The original installation consisted of six light electroliers with ordinary 10-candlepower incandescent lamps, placed seven and three-fourths feet from the floor. The "Gem" installation consisted of 125-watt high-candlepower units, with holophane reflectors. These units were installed on the ceiling fourteen feet above the floor.

DOSSERT & COMPANY.

Among the labor-saving devices in the field of electrical construction, none is likely to attract more attention than that of Dossert & Company, Inc., manufacturers of the well-known "Dossert Joints" and solderless connectors and terminals for electric wires and cables. Dossert & Company is one of the younger set, and although its advent in the field of manufacturing electrical equipment is of comparatively recent date, the remarkable increase of the company's business during the past three years, in the face of apparently insuperable obstacles, has attracted not a little attention in the electrical world.

The history of the triumph of the Dossert principle is well known to those who have followed the many phases of development in electrical work, but a word of recapitulation may not be out of place. The Dossert Joint is a mechanical device designed to splice wires securely and to make a perfect electrical connection without the use of solder. This, of course, was a proposition to revolutionize the method of splicing wires, and when Dossert & Company asked for the approval of the National Board of Fire Underwriters, in 1905, the new joint was examined with great interest. It was then decided, however, as the practice in vogue afforded nothing on which to base judgments as to how the Dossert device would meet the varied requirements and contingencies of usage, field experience was necessary. Provisional approval was accordingly granted, subject to the assent of local inspectors. After field experience and laboratory tests covering a period of over two years, the National Board of Fire Underwriters, at their meeting in New York in March, 1907, unanimously adopted an amendment to the rules allowing the use of an approved mechanical joint without solder. Two months later, the Dossert Joints were placed on the list of approved fittings, and it is the only approved mechanical joint.

In the field of electric railways and the electrification of steam railroads, the Dossert Joints have indeed met the proverbial "long-felt want." The list of users is a long one, headed by such names as the Pennsylvania, New York Central, Delaware & Hudson, Interborough-Metropolitan, Chicago City Railways, Metropolitan West Side Elevated, Philadelphia Rapid Transit, and many others. Dossert & Company's factory and office is at 242-244 Forty-first Street, New York City. F. A. Lawson & Co. are Pacific Coast agents, at 209 Monadnock Building. San Francisco, California.

NEWS NOTES

TELEPHONES.

Washougal, Wash.—Home Telephone Company, $1,000. C. M. Keep, Morris Webber and A. J. Hendrickson.

Leavenworth, Wash.—The Clockum Telephone Co. was given a franchise to erect and operate a telephone line along the county roads.

Aberdeen, Wash.—J. A. Phillips and others were granted a franchise for a telephone on the Johns River road, between Western and Markham.

Seattle, Wash.—Application has been made by John L. North et al., for a telephone franchise. Hearing will be had on same April 14th.

Newport, Wash.—R. D. Anderson, who was recently granted a telephone franchise by the Newport authorities, has begun the construction of the new exchange and system.

Rockford, Wash.—Workmen have been engaged on the Mount Hope and Rockford telephone line and connections, stringing an extra wire and making the line a metallic circuit.

Colville, Wash.—E. H. Humphrey has been granted a franchise to build a telephone line from Blue Creek to Eddy, along the public highway, with the privilege to extend for fifty years.

Sunnyside, Wash.—Sunnyside Telephone Co., of Yakima, $15,000. J. J. Brown, Emery Thompson, George E. Rodman, F. J. Taylor, U. G. Merrill and S. T. Woodin are the new incorporators.

Silverton, Ore.—P. L. Brown is extending his telephone lines farther into the country daily, and is connected with about all the towns in Marion and Clackamas counties, and a farm house without a phone is rarer than those with them.

Kent, Wash.—The Pacific Sunset Telephone & Telegraph Company is making arrangements to improve Kent long-distance service, by giving Kent an additional Tacoma-Seattle wire, and stringing an additional wire direct from Kent to Seattle.

Vancouver, Wash.—Moore & Hardin, local contractors, have secured the contract for putting in the concrete work for the Home Telephone Company. The Minnehaha foundry is turning out the manholes for the same company, and has already delivered a large number.

Colfax, Wash.—The farmers of the wheat belt lying south of Colfax, between here and the Snake River, have organized a company for an extensive system of rural telephone lines. The new company is known as the Penawawa Telephone Company, Ltd., and the line starts from the long-distance office at Colfax.

Bellingham, Wash.—Five hundred feet of the Magnolia Street underground system of the Sunset Telephone Company has been destroyed by electrolysis, caused by a current from the Whatcom County Railway & Light Company's trolley system. A current from the rails has penetrated the ground several yards distant and for a depth of about five feet, reaching the lead pipe casing of the telephone cables and making them useless. The telephone company has laid temporary wires for the benefit of subscribers affected by the paralysis. The damage to the company in cable alone is $750.

Edmonds, Wash.—Articles of incorporation of the Edmonds Independent Telephone Company were filed last week. The capital stock is $2,500, and the officers are: President, A. M. Yost; vice-president, James Mowatt; secretary, Zophar Howell; treasurer, T. A. A. Siegfried. Other stockholders are: J. N. Otto, O. W. Schmidt, C. D. Everton, Charles Preston and C. D. Johnson.

Vancouver, B. C.—The Dominion government, in response to a numerously-signed petition, has decided to establish a system of telegraph communication between Prince Rupert on the mainland and the Queen Charlotte Islands. It will also build a telegraph or telephone line to connect the islands of the group, and will also install a system of gas buoys at various points on the islands, including Jedway, the new mining camp.

WATERWORKS.

Eureka, Cal.—G. M. Scott claims 600 inches of water flowing in Oil Mill Creek, in T. 8 N., R. 1 W., for the purpose of supplying water to residents of Trinidad, and for general electric power.

Los Angeles, Cal.—The Brawley Town & Improvement Company has plans completed for an expansion of the domestic water service to cover many new sections of the townsite. Within the ensuing month from 15,000 to 20,000 feet of new water mains will be laid.

Ogden, Utah.—The Wheelwright Construction Company, of Ogden, has closed a contract with the American Falls Realty & Waterworks Company, of Pocatello, for the construction of a waterworks system at American Falls, which will cost about $15,000.

San Francisco, Cal.—The Sunnyside Improvement Club has filed a complaint against the Spring Valley Water Company with the Supervisors. It is alleged that at times householders are without water, and in the event of a fire the engines would be out of commission.

Lodi, Cal.—At a meeting of the City Trustees this week, several sites for the proposed municipal water and light plant were considered, and the Osborne tract in South Lodi was selected as the best adapted for the purpose. It will be acquired for the purpose by the usual method of procedure. The plans of a water and light plant to established at Rawhide, Nev., were exhibited at the meeting, by J. S. Williard, of Oakland. This system will cost $50,000, not including the pipe and freight.

ELECTRIC RAILWAYS.

Grants Pass, Ore.—The Council is now considering the application of W. H. Patillo for an electric street railway franchise.

Ashland, Ore.—The Rogue River Electric Rapid Transit Company filed articles of incorporation at Grants Pass. The incorporators are Captain Evans, F. E. Merrick, J. E. Watt, Dr. Page, A. S. Bilton and S. A. Nye.

Pasadena, Cal.—Mayor Farley has been informed by officials of the Pacific Electric System that H. E. Huntington has directed that work of double-tracking the lines in Pasadena proceed. This work was halted last fall by financial stress.

San Diego, Cal.—The bid of the San Diego Electric Railway Co. for a street railway franchise on Hawk and Lewis streets which called for $125, was accepted by the City Council at a recent meeting. It is for an extension of the Third Street line.

Klamath Falls, Ore.—The Inland Electric Company has appeared before the Klamath Falls Council asking for a franchise from the eastern limits of the city to the end of the line of the Klamath Falls Land & Transportation Company. It is the intention of the company to construct and operate a line between this city and Merrill. Some rights of way have been secured.

Walla Walla, Wash.—Arrangements have been almost completed for the construction of a street car line from the business part of the city to the Fair Grounds. The track will be an extension of the city line, and about three-quarters of a mile must be built. In order to secure it, stockholders of the Fair Association have agreed to take care of $10,000 bonds of the traction company.

Berkeley, Cal.—A number of surveyors working under the direction of Albert van der Naillen have been engaged in mapping out the route of the proposed electric line which will be operated, by Sam L. Naphtaly and others, from the Claremont Hotel in Berkeley over the tunnel road to Walnut Creek and adjoining towns. A route for the proposed line was surveyed last fall, but the three-per-cent grade was found to be too steep for the style of motor that will draw the cars over the tunnel road. The engineers are seeking a two-per-cent grade.

Olympia, Wash.—The Pacific Power & Railway Company has served upon the State Land Commissioner notice that it will petition the Superior Court of Cowlitz County to condemn and appropriate the waters of Toutle River. It is intended to use the power furnished by the river to generate electricity to operate a railway from Vancouver via Kalama and Kelso to Castle Rock, and branch lines from Castle Rock to the head of Green River and to Spirit Lake. It has been reported that this company is affiliated with the organization of capitalists who are planning the construction of an interurban railway between Seattle and Portland.

Palouse, Wash.—Julius Muhrbeck, superintendent of construction on the Spokane & Inland, has been in Palouse during the week, looking over the ground and arranging to begin laying steel on the Moscow extension about April 1. Mr. Muhrbeck states that from 75 to 100 men will be required on the work. The grading between here and Moscow was practically completed last fall, with the exception of one large dirt cut about half way between the two towns. It is estimated that trains will be running into Moscow by August 1. A local rumor is that the road will be built on to Lewiston without any delay.

Granger, Wash.—The Inter Valley Electric Railway Company held a business meeting in North Yakima last week, and elected the following officers: H. H. Lombard, president, North Yakima; J. H. Thomas, vice-president, Yakima City; Geo. P. Eaton, secretary, Granger; R. G. Page, treasurer, Sunnyside. Walter N. Granger, owing to a press of other business, resigned as trustee, and E. F. Blaine, of Seattle, was elected to fill the vacancy. The company has engaged F. N. Noble as head of the engineering department. He has already made the survey between Granger and Parker, and the right of way committees will go into the field Monday. There seems to be at present every indication that the company will be running cars and relieving this season the annual congestion of freight traffic.

Portland, Ore.—Between this date and April 1 the Mount Hood Railway Company will resume construction work with a larger force of men than it was employing prior to the financial stringency that stopped work last October. The Mason Construction Company, which retains the contract for twenty-five miles of the line between Portland and Bull Run, will put on about 800 men and the railroad will be pushed through to the east limits of the city. Machinery for the first installation of 15,000 horsepower is now being received every week for the Mount Hood Company's big electric power plant at Bull Run postoffice. The water from the Sandy River is to be utilized there to generate power. A vat reservoir is being erected on the plateau near Bull Run postoffice, where the company has purchased many hundreds of acres of land.

San Francisco, Cal.—The residents of Pacific Avenue have been promised a cable system by the United Railroads and the officials of the company have announced that the line would be in operation between Polk and Broderick streets within six weeks. A letter was received by Oscar Sutro, one of the opponents of the proposed trolley system on that street, from Patrick Calhoun, president of the United Railroads, in which Mr. Calhoun promised to install a cable line if a majority of the residents on Pacific Avenue wanted it. "We now have in our possession," said Mr. Sutro, "a petition signed by seventy per cent of the property owners on Pacific Avenue, between Polk and Broderick streets, asking for a cable system." Cars will have to stop at Polk Street, as they are not of the same gauge as the trolley cars operated on parallel streets running to the ferry landing. Transfers will be issued from the Polk Street terminal to the other line operated by the company.

ILLUMINATION.

San Francisco, Cal.—Forty arc lights will be reinstalled in the Park Panhandle and along the main drive leading to Strawberry Hill, as directed by the Supervisors' artificial lights committee.

Riverside, Cal.—An application for a gas franchise has been made to the Board of Supervisors by the Banning Gas & Lighting Company, to operate in the streets of Banning and Beaumont, Riverside County.

Oroville, Cal.—A few weeks ago the Valley Counties Power Company sold to the Bay Counties Power Company all its property of every kind in Butte County. Last week two more power company transfers were made: The Bay Counties Power Company transferred to the California Gas & Electric Corporation the property obtained from the Valley Counties Power Company. The California Gas & Electric Corporation transfers to the Pacific Gas & Electric Company all the lots, pieces or parcels of land in Butte County named in a deed from the Valley Counties Power Company to the Bay Counties Power Company.

OIL.

Ellensburg, Wash.—Miller Bros., of this city, have closed options on 600 to 700 acres of land in Badger Pocket, where they will shortly begin drilling for oil, there being excellent indications on the farm of Louis Larsen. They contemplate going down 2,000 feet, or even deeper, and have ordered special machinery for deep-hole work.

Los Angeles, Cal.—It is reported that the Sunset Railroad is to be extended into the Midway field. Southern Pacific surveyors are at work along the prospective right of way. If the report is correct, the Midway operators will come into their own. That district is suffering from lack of transportation facilities, and the price of oil is ten cents a barrel less than at other fields of the San Joaquin Valley.

Santa Maria, Cal.—The Palmer Oil Company has entered into a contract for a pipe line having a daily capacity of 12,000 barrels, to be built from its new field to Santa Maria. The Associated Company, which has purchased 2,000,000 barrels of Palmer oil, will do the construction work. The line will be finished within seventy-five days, by which time the contracting company will have about 35,000 barrels of petroleum ready for delivery. The Palmer land is about three and one-half miles from the rich Santa Maria producing field.

Los Angeles, Cal.—At an approximate cost of $700,000, the American Petroleum Company has taken over the ranch of William Niles, at Sherman, and has three rigs boring for oil. This ranch is surrounded by proved oil wells, and is considered an important deal. The American Petroleum Company was quietly organized several weeks ago, with a capital said to be nearly $10,000,000. The American Petroleum Company already controls and is interested in about 11,000 acres of oil-bearing land in Monterey County. Development work is being pushed.

Los Angeles, Cal.—At 2,755 feet down, the Newport Bay Oil Company has its first well at Newport Beach on the pump, after months of trouble and delay. It is but four inches and a half in circumference at the bottom, and the hole is not perfectly straight, hence only a two-inch pump can be used. The present output is between 75 and 150 barrels a day. Water, encountered at 2,160 feet, gives much trouble, and the yield of oil is from ten per cent to seventy-five per cent to proportion of water, varying this much from day to day. It is the usual California asphalt base, 25 to 30 gravity, or possibly higher, declared by a local refinery to be among the very best produced for making light distillates, $1.05 a barrel being offered at the well. Three hundred to four hundred barrels have been taken out and used in further drilling.

Bellingham, Wash.—The Bellingham Bay & British Columbia Railway this year will improve about a mile of its tracks in this city, between the Sehome Dock and York Street. The tracks have become shapeless in places. The work will be started soon. The company also contemplates laying heavier steel on the grade beyond Whatcom Creek for about two miles. Sixty-pound rails will be laid. Just when this work will begin Supt. H. B. Paige is unable to say.

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